WHAT IS CLAIMED IS:

1. A thin film magnetic head comprising:

a lower core layer extending from a surface facing a recording medium in a height direction;

a protruding layer extending on the lower core layer for a predetermined length from the surface facing the recording medium in the height direction;

a back gap layer disposed on the lower core layer separated from a rear end of the protruding layer by a first distance in the height direction;

a coil layer disposed in a space surrounded by at least the lower core layer, the protruding layer and the back gap layer;

a coil insulating layer covering the coil layer, tops of the coil insulating layer, the protruding layer and the back gap layer being planarized to a continuous flat surface;

a Gd-determining layer disposed on the flat surface separated from the surface facing the recording medium by a second distance in the height direction.

a lower magnetic pole layer and gap layer disposed in that order on the flat surface in each of a region between the surface facing the recording medium and the Gd-determining layer and a region behind the Gd-determining layer in the height direction; and

an upper magnetic pole layer disposed on the gap layer and the Gd-determining layer;

wherein the lower magnetic pole layer, the gap layer and

the upper magnetic pole layer have a same planar shape, and a track width is determined by a width of the upper magnetic pole layer in a track width direction at the surface facing the recording medium.

2. A thin film magnetic head according to claim 1, wherein the lower magnetic pole layer, the gap layer and the upper magnetic pole layer are formed by plating.

3. A thin film magnetic head according to claim 1, wherein the upper core layer is formed on the upper magnetic pole layer into the same planar shape as that of the upper magnetic pole layer, and the upper magnetic pole layer and lower magnetic pole layer have a higher saturation magnetic flux density than that of the upper core layer.

4. A thin film magnetic head according to claim 3, wherein the upper core layer has a larger thickness than that of the upper magnetic pole layer.

5. A thin film magnetic head according to claim 1, wherein the upper magnetic pole layer and lower magnetic pole layer have a higher saturation magnetic flux density than those of the lower core, the protruding layer and the back gap layer.

6. A thin film magnetic head according to claim 1, wherein the upper magnetic pole layer has a planar shape

comprising a front end portion which has a width corresponding to the track width at the surface facing the recording medium and which extends in the height direction while the width one of remains substantially constant and widens, and a rear end portion which widens from a base end of the front end portion in the track width direction so that the width increases in the height direction.

7. A thin film magnetic head according to claim 1, wherein a boundary between a bottom and a front end surface of the Gd-determining layer, which is positioned more proximate to the surface facing the recording medium than a rear end surface of the Gd-determining layer, is positioned on the protruding layer;

the Gd-determining layer is formed on both the protruding layer and the coil insulating layer; and

a length from a boundary between the top and rear end surface of the protruding layer in the height direction to the boundary between the bottom and rear end surface of the Gd-determining layer in the height direction is larger than a maximum thickness of the Gd-determining layer.

8. A thin film magnetic head according to claim 7, wherein the boundary between the bottom and rear end surface of the Gd-determining layer is positioned one of on the back gap layer and on a boundary between the top and front end surface of the back gap layer, which is positioned more proximate to the surface facing the recording medium than a

rear end surface of the back gap layer, and the Gd-determining layer is disposed between the top of the coil insulating layer and a bottom of the upper magnetic pole layer.

9. A thin film magnetic head according to claim 1, further comprising a first plated underlying layer provided on at least a portion of the flat surface between a rear end surface of the Gd-determining layer and a front end surface of the back gap layer, which is positioned more proximate to the surface facing the recording medium than a back end surface of the back gap layer, the lower magnetic pole layer being formed on the first plated underlying layer by plating.

10. A thin film magnetic head according to claim 9, wherein the first plated underlying layer comprises a nonmagnetic metal material.

11. A thin film magnetic head according to claim 9, further comprising a second plated underlying layer formed on the protruding layer and separated from the first plated underlying layer, wherein at least the Gd-determining layer is disposed between the first and second plated underlying layers, the second plated underlying layer comprises a magnetic material, and the lower magnetic pole layer is formed on the second plated underlying layer by plating.

12. A thin film magnetic head according to claim 1,

further comprising a third plated underlying layer formed on only a portion of the Gd-determining layer, the upper magnetic pole layer being formed on the third plated underlying layer by plating.

13. A thin film magnetic head according to claim 1, wherein the coil layer is formed on a plane parallel to the surface of the lower core layer so as to be wound around the back gap layer as a center.

14. A thin film magnetic head according to claim 1, wherein the coil layer comprises a plurality of first coil segments formed in parallel to each other in the space surrounded by the lower core layer, the protruding layer and the back gap layer, and a plurality of second coil segments formed in parallel to each other on the upper magnetic pole layer with an insulating layer provided therebetween, the first coil segments being non-parallel to the second coil segments; and

an end of each first coil segment and an end of each second coil segment face each other in the thickness direction of the upper magnetic pole layer and are connected to each other through a connecting portion to form a toroidal coil structure.

15. A method of manufacturing a thin film magnetic head comprising:

(a) forming a lower core layer such that the lower core

layer extends from a surface facing a recording medium in a height direction;

(b) forming a coil insulating underlying layer on the lower core layer, and forming a coil layer on the coil insulating underlying layer within a predetermined region, the coil layer having a front end surface that is more proximate to the surface facing the recording medium than a rear end surface of the coil layer;

(c) forming a protruding layer on the lower core layer to extend the protruding layer from the surface facing the recording medium in a height direction so that the protruding layer is out of contact with the front end surface of the coil layer, the protruding layer being formed one of before and after the formation of the coil insulating underlying and coil layers, the protruding layer having a front end surface that is more proximate to the surface facing the recording medium than a rear end surface of the protruding layer, and forming a back gap layer on the lower core layer separated from the rear end surface of the protruding layer in the height direction so that the back gap layer is out of contact with the coil layer, the back gap layer having a front end surface that is more proximate to the surface facing the recording medium than a rear end surface of the back gap layer;

(d) covering the coil layer with a coil insulating layer so that tops of the protruding layer, the insulating layer and the back gap layer are formed in a continuous flat surface;

(e) forming a Gd-determining layer on the flat surface at a predetermined distance from the surface facing the recording medium the Gd-determining layer having a front end surface that is more proximate to the surface facing the recording medium than a rear end surface of the Gd-determining layer;

(f) forming a lower magnetic pole layer and a gap layer on the flat surface in a region between the Gd-determining layer and the surface facing the recording medium and a rear region behind the Gd-determining layer in the height direction, and further forming an upper magnetic pole layer over the gap layer and the Gd-determining layer.

16. A method of manufacturing a thin film magnetic head according to claim 15, wherein in (f), the lower magnetic pole layer, the gap layer and the upper magnetic pole layer are continuously formed by plating.

17. A method of manufacturing a thin film magnetic head according to claim 15, wherein each of the upper magnetic pole layer and the lower magnetic pole layer is formed by using a material having a higher saturation magnetic flux density than that of the upper core layer in (f), and the upper core layer is continuously formed on the upper magnetic pole layer by plating after (f).

18. A method of manufacturing a thin film magnetic head according to claim 15, wherein in (f), each of the upper

magnetic pole layer and the lower magnetic pole layer is formed by using a material having a higher saturation magnetic flux density than those of the lower core layer, the protruding layer and the back gap layer.

19. A method of manufacturing a thin film magnetic head according to claim 15, wherein in (f), the upper magnetic pole layer is formed in a planar shape comprising a front end portion which has a width corresponding to a track width at the surface facing the recording medium and which extends in the height direction while the width one of remains constant and widens so that the track width increases in the height direction, and a rear end portion which widens from a base end of the front end portion in the track width direction so that the width increases in the height direction, and the lower magnetic pole layer, the gap layer and the upper core layer are formed in the same planar shape as that of the upper magnetic pole layer.

20. A method of manufacturing a thin film magnetic head according to claim 15, wherein in (e), the Gd-determining layer is formed from the protruding layer to the coil insulating layer so that a boundary between a bottom and the front end surface of the Gd-determining layer is positioned on the protruding layer, and a length in the height direction from a boundary between the top and rear end surface of the protruding layer in the height direction to the boundary between the bottom and rear end surface of the Gd-determining

layer in the height direction is larger than a maximum thickness of the Gd-determining layer.

21. A method of manufacturing a thin film magnetic head according to claim 20, wherein the Gd-determining layer is formed one of from the protruding layer to the coil insulating layer and from the protruding layer to the coil insulating layer and the back gap layer so that the boundary between the bottom and the rear end surface of the Gd-determining layer is positioned one of on the back gap layer and on the boundary between the top and front end surface of the back gap layer, and the Gd-determining layer is interposed between the top of the coil insulating layer and a bottom of the upper magnetic pole layer.

22. A method of manufacturing a thin film magnetic head according to claim 15, further comprising forming a first plated underlying layer on at least a portion of the flat surface between the rear end surface of the Gd-determining layer in the height direction and the front end surface of the back gap layer, between (d) and (e), and forming the lower magnetic pole layer on the first plated underlying layer by plating.

23. A method of manufacturing a thin film magnetic head according to claim 22, wherein the first plated underlying layer comprises a nonmagnetic metal material.

24. A method of manufacturing a thin film magnetic head according to claim 22, further comprising forming a second plated underlying layer on the protruding layer separated from the first plated underlying layer, wherein at least the Gd-determining layer is disposed between the first and second plated underlying layers, the second plated underlying layer comprises a magnetic material, and the lower magnetic pole layer is formed on the second plated underlying layer by plating.

25. A method of manufacturing a thin film magnetic head according to claim 15, further comprising forming a third plated underlying layer on only a portion of the Gd-determining layer, and forming the upper magnetic pole layer on the third plated underlying layer by plating.

26. A method of manufacturing a thin film magnetic head according to claim 15, wherein the coil layer is formed on a plane parallel to a surface of the lower core layer so as to be wound around the back gap layer as a center.

27. A method of manufacturing a thin film magnetic head according to claim 15, wherein the coil layer comprises a plurality of first coil segments formed in parallel to each other in a space surrounded by the lower core layer, the protruding layer and the back gap layer, and a plurality of second coil segments formed in parallel to each other on the upper magnetic pole layer with an insulating layer provided

therebetween, the first coil segments being non-parallel to the second coil segments; and

an end of each first coil segment and an end of each second coil segment face each other in a thickness direction of the upper magnetic pole layer and are connected to each other through a connecting portion to form a toroidal coil structure.